I. WITNESS INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is William Walsh. My business address is 7135 Janes Avenue, Woodridge, Illinois, 60517.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed as a Senior Project Manager by EN Engineering, an engineering and consulting firm specializing in pipeline design services for the oil and gas industry.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I hold a Ph. D. in Theoretical and Applied Mechanics from Northwestern University (Evanston, Illinois). In addition, I hold an M.S. degree in Metallurgical Engineering and a B.S. degree in Engineering Mechanics from the University of Illinois at Urbana-Champaign. I am a registered professional engineer in the state of Illinois. My professional experience consists of employment in the pipeline industry with EN Engineering and with Natural Gas Pipeline Company of America, both in the Metallurgy groups. My responsibilities in these positions range from material specification for pipe and components, welding procedure development, investigation and root cause analysis of failures, non-destructive testing, and fitness-for-service evaluations. In addition, I have worked in the manufacturing industries with Rexam Beverage Can and Snap-on Tools, and as a Research Scientist at Battelle Columbus Laboratories. My resume is included in Exhibit A.

Q. ON WHOSE BEHALF WAS THIS TESTIMONY PREPARED?

A. This testimony was prepared on behalf of the Staff of the South Dakota Public Utilities Commission (Staff).

II. PURPOSE OF THE TESTIMONY

Q. PLEASE STATE THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING.

A. The main objective of the Staff in this testimony is to ensure that TransCanada Keystone Pipeline, LP (Keystone) has met the requirements of the Federal Pipeline Safety Regulations 49CFR 195, Transportation of Hazardous Liquids by Pipeline, with respect to Keystone's application for a permit (Permit) to construct and operate a crude oil pipeline in South Dakota as well as additional filings. This testimony deals specifically with the areas of Design Requirements (Subpart C), Construction (Subpart D), Pressure Testing (Subpart E), and Operation and Maintenance (Subpart F). Additional requirements in these areas have been placed upon Keystone as a condition of being granted a special permit to operate the pipeline at a hoop stress level of 80% of the

specified minimum yield strength (SMYS) of the pipe material. These additional requirements will be noted in the appropriate portions of this testimony.

Q. HOW WILL YOUR TESTIMONY BE ORGANIZED?

A. The testimony will address the relevant portions of the Federal requirements related to Keystone's application and supplemental filings. Since the conditions of the special permit to operate at 80% of SMYS affect the requirements of the Federal regulations, an overview of the permit provisions will be presented first. Each subpart of the Federal requirements will then be addressed separately. At the conclusion of the testimony, I will present an overall assessment of the pipeline design, construction, and operation practices and their relative risk to the environment and safety.

III. EVALUATION OF THE APPLICATION

a. Special Permit Considerations

Q. HOW DOES THE SPECIAL PERMIT TO OPERATE THE KEYSTONE PIPELINE AT 80% OF SMYS RELATE TO THE FEDERAL SAFETY REGULATIONS?

A. The internal design pressure section of the Federal Regulation section 195.106 requires that pipelines be designed to operate at maximum pressures that result in hoop stresses in the pipe of 72% of Specified Minimum Yield Strength (SMYS). The granting of the special permit, attached as Exhibit B, allows Keystone to operate the majority of the pipeline at 80% of SMYS. Pipe at pump stations, road crossings, railroad crossings, launcher/receiver fabrications, population High Consequence Areas (HCA's) and navigable waterways must be designed at 72% SMYS. The special permit places more stringent conditions on other parts of the Federal Safety Regulations in order to maintain or exceed the level of safety of the pipeline operation. These additional safety measures will be addressed in other sections of this testimony.

Q. WHAT IS THE PHYSICAL DIFFERENCE BETWEEN THE PIPELINE DESIGN AT 72% OF SMYS AND AT 80% OF SMYS?

A. Comparing two pipe designs, each with the same strength steel and outside diameter (OD), the pipe at 80% SMYS design will have a 10% thinner wall than the 72% SMYS design. This is illustrated in the following example. Using the design formula in section 195.106:

80% SMYS design

- SMYS of the steel = 80,000 pound per square inch (psi)
- OD = 30 inches
- Maximum Operating Pressure (MOP) = 1440 psi
- Design Factor F = 0.80
- Pipe Wall Thickness = 0.338 inches

72% SMYS design

- SMYS of the steel = 80,000 pound pre square inch (psi)
- OD = 30 inches
- Maximum Operating Pressure (MOP) = 1440 psi
- Design Factor F = 0.72
- Pipe Wall Thickness = 0.375 inches

(0.338" – 0.375") / 0.375" = -0.10 = 10% wall thickness reduction

Q. WHAT AREAS OF THE FEDERAL SAFETY REGULATIONS ARE MADE MORE STRINGENT IN ORDER TO MAINTAIN OR EXCEED THE LEVEL OF SAFETY AFFORDED THE PIPELINE AT A 72% SMYS DESIGN?

A. A total of 51 additional conditions are required of Keystone in order to operate under the provisions of the special permit. More stringent requirements are applied to:

- Pipe steel mechanical and chemical properties
- Inspection and pressure testing
- Depth of cover over the buried pipe
- Leak detection through Supervisory Control and Data Acquisition (SCADA) system
- Internal and external corrosion prevention procedures
- Integrity management.

b. 49CFR 195 Requirements

Q. WHAT ASPECTS OF PIPELINE SAFETY ARE ADDRESSED IN SUBPART C - DESIGN REQUIREMENTS?

A. Subpart C addresses the aspects of pipeline design pertaining to pipe materials and manufacture, pipeline components such as fittings and valves, design requirements for external loading, and leak detection systems. Many of the requirements for pipe and pipeline components are included in external specifications and are incorporated by reference into 49 CFR 195. These documents are listed in 195.3.

Q. 195.102 – WHAT IS THE DESIGN TEMPERATURE FOR THE PIPELINE SYSTEM?

A. The special permit condition (16) stipulates that the pipeline temperature shall not exceed150° F. Keystone uses a design temperature of 167° F for choosing pipeline components (Data Response 6-16). The pipeline will operate at a minimum temperature of 45.5-degrees F, and a maximum temperature of 100.4-degrees F. The design temperatures therefore result in a conservative design. Since the actual temperature will be maintained below the design temperature, components will undergo less deformation under operating conditions. The stiffness of steel components decreases as temperature

increases, so maintaining actual temperature below the design temperature increases stiffness and eliminates excessive deformation.

The minimum temperature specifications of -50° F for above ground piping and -45° F for equipment are consistent for expected minimum temperatures for South Dakota winters. Fracture toughness specifications for pipe required in the special permit condition (4) ensure adequate fracture initiation and propagation at the minimum design temperature.

Q. 195.110 – WHAT EXTERNAL LOADS HAVE BEEN CONSIDERED IN THE DESIGN OF THE PIPELINE SYSTEM?

A. All crossings will utilize thicker pipe instead of cased crossings. This is generally the preferred design method due to the increased risk of corrosion occurring on the carrier pipe inside the casings. The design of the crossings is discussed in more detail regarding part 195.256 in this testimony.

External loadings from blasting at the Spencer Quarry near milepost 376 were brought up as concerns in a public hearing on the Keystone pipeline. Keystone has indicated the blasting at the quarry will not affect the pipeline (Data Response 6-18). The effect of loads on pipelines from blasting was studied in a Pipeline Research Committee International (PRCI) report titled Pipeline Response to Blasting in Rock published in 1991. The models in this report suggest that even large blasts of 32 tons result in only an additional 1300 psi stress on the line or about 2% additional stress. This result is insignificant on the operational integrity of the pipeline.

Q. 195.112 – WHAT PROVISIONS FOR PIPE MATERIAL QUALITY ARE BEING USED IN THE KEYSTONE PIPELINE?

A. CFR 49 195 requirements are modified by the special permit conditions 1,2,4,5,6,8,and 9.

Condition 1 – Steel Properties: The requirements in this section state the steel is to be made to the highest steelmaking technology standards in use for making pipe currently available. This requirement is typically in most pipeline operator pipe specifications. This condition ensures that the practice must be used for the Keystone pipeline.

Condition 2 – Manufacturing Standards: The pipe must be made to API 5L Product Specification Level 2. This is the highest specification and is typically specified for oil and gas applications. The carbon equivalent in the steel is specified to be held below 0.23 (Pcm formula). Carbon equivalent is a measure of susceptibility to cracking during welding; the lower the carbon equivalent, the less susceptibility to cracking. The 0.23 level required in this condition is adequate to minimize risk of cracking.

Condition 4 – Fracture Control: The fracture control conditions specify shear areas for Charpy V-Notch and Drop Weight Tear Testing in excess of 80% (all heat average). This stipulation should ensure that ductile fracture propagation will not occur in the Keystone crude oil pipeline. Keystone has also indicated in the application for the special permit

that absorbed energy during the Charpy V-Notch test will maintain an all heat average above 74 ft.-lbs. This steel toughness level will provide sufficient protection against the initiation of a fracture.

Condition 5 – Steel Plate Quality Control: The steel mills supplying pipe must have a quality program in place to monitor for laminations by ultrasonic testing and for centerline segregation by macro etch testing. Both of these monitoring requirements are typically not included in the production of line pipe so they provide a higher level of pipe steel quality.

Condition 6 – Pipe Seam Quality Control: Cross section samples for each heat of steel are monitored for excessive hardness which may lead to cracking. This quality measure is required by API 5L - PSL 2 pipe.

Condition 8 – Puncture Resistance: An excavator size of 65 tons is required for a tooth size of 3.54 inches by 0.137 inches wide. The strength of the steel and wall thickness of the pipe are enough to satisfy this requirement.

Condition 9 – Mill Hydrostatic Test: The required test of 95% of SMYS for 10 seconds is greater than the typically applied 90%, again resulting in a conservative design.

The stipulations in place on steel quality manufacture, properties, and inspection ensure that the pipe used on this project is of very high quality. These requirements have been evolving, becoming steadily more stringent, as PHMSA has reviewed more special permit applications for 80% SMYS pipeline applications.

Q. 195.120 – WHAT PROVISIONS FOR INTERNAL INSPECTION DEVICES ARE INCLUDED IN THE KEYSONE PIPELINE?

A. First, I will provide additional information of the capabilities of internal inspection devices. Internal inspection devices, often referred to as pigs or in-line inspection tools, are tools used to non-destructively test the pipe from the inside by using sensors. Internal inspection tools have various capabilities such as detecting metal loss, cracks and dents. In order for a pipeline to accept internal inspection devices, the pipeline must be equipped with pig launchers and receivers.

In the Keystone pipeline design, pig launchers and receivers are spaced at about 230 mile intervals to accommodate internal inspection tools. This is generally adequate to ensure the line has the capability for proper in-line inspection.

Q. 195.134 – WHAT PLANS FOR LEAK DETECTION ARE INCLUDED IN THE KEYSONE PIPELINE?

A. Special Permit Conditions 25-33 outline requirements that essentially state that Keystone's Supervisory Control and Data Acquisition (SCADA) Systems must employ state of the art technology for leak detection. The system must be approved by PHMSA prior to operation.

Q. WHAT ASPECTS OF PIPELINE SAFETY ARE ADDRESSED IN SUBPART D - CONSTRUCTION?

A. Subpart D provides the minimum requirements for construction practices for hazardous liquid pipelines. The areas addressed are inspection of pipe on the right of way, welding practices including repair and removal of defects, installation of pipes in the ditch, backfill, crossing of roads and railroads, valves, pumping equipment, and facility security. The granting of the special permit places additional stringent requirements on construction practices.

Q. 195.202 – HAS KEYSTONE WRITTEN A SET OF COMPREHENSIVE CONSTRUCTION SPECIFICATIONS FOR THE EXECUTION OF THIS PROJECT?

A. The special permit requires that construction plans, schedules, and specifications be submitted to PHMSA for review two months prior to start of construction (Condition 18). In addition, a construction quality assurance plan is required to be maintained throughout the construction process (Condition 21). A draft of the Construction Specifications is currently being prepared by Keystone for this project (Data Response 6-25). The document will be finalized upon receipt of applicable Federal and State permits required to construct the project.

Q. 195.212 – WHAT IS THE SPECIFICATION FOR FIELD BENDING OF PIPE?

A. For 30" diameter line pipe, the specification is 1.5° per 30" length of pipe. This specification is typical in the pipeline industry and will likely result in pipe bends free of wrinkles. (Data Response 6-27). Wrinkle free bends are desired to maintain the pipe steel integrity.

Q. 195.214 – HAVE WELDING PPROCEDURES BEEN PREPARED FOR THIS PIPELINE PROJECT?

A. Welding procedures are typically developed prior to the commencement of construction. Keystone is required by Condition (19) of the special permit to notify PHMSA within 14 days of the beginning of the welding qualification activities.

Q. 195.246 – WILL KEYSTONE'S PROCEDURE FOR LOWERING THE PIPE INTO THE DITCH RESULT IN LOW STRESSES AND A MINIMAL CHANCE OF COATING DAMAGE?

A. In Data Response 6-29, Keystone indicated that a minimum of four side booms and a backhoe, spaced 60 to 80 feet apart, will be used for lowering the pipe into the ditch. The bending stress resulting from this procedure is only about 5% of SMYS. Select fine material will be used to provide a uniform and padded ditch bottom for pipe support. Also, the coating will be inspected with an electronic holiday detector (a holiday is a small hole in the pipe coating) prior to being placed in the ditch. This procedure is typical during pipeline construction.

Q. 195.248 – IS THE DEPTH OF COVER FOR THE PIPELINE ADEQUATE TO PROTECT AGAINST THIRD PARTY DAMAGE?

A. Special Permit Condition (20) requires that the depth of cover over the pipeline be increased from the values in 195.248 to add an increased measure of protection against third party damage. Keystone will use 48" of cover, increased from 36" required in 195.428 in all areas except in consolidated rock. The requirement for extra cover is a very good measure of protection against the possibility of damage to the pipeline.

In addition, where pipeline is buried less than 42" (consolidated rock), additional markers must be placed along the pipeline.

Q. 195.256 – WHAT ARE THE DESIGN REQUIREMENTS FOR PIPELINES CROSSING ROAD AND RAIL CROSSINGS?

A. Section 195.256 requires that the pipeline must be designed to withstand vehicular loads at crossings. Keystone will use pipe with 0.515 inch wall thickness at all crossings. This wall thickness provides adequate protection when analyzed using the methodology developed at Cornell University by Stewart and O'Rourke, commonly referred to as 'PC Picses' in the pipeline industry. The wall thickness was adequate at rail crossings for depths ranging from 6 feet to 14 feet deep, and highway crossings from 3 feet to 10 feet deep. Typically the wall thickness is determined by the stresses during installation by boring rather than the requirement for withstanding vehicular loads (Data Response 6-19).

Q. 195.260 – WHAT CONSIDERATIONS ARE REQUIRED FOR PLACEMENT OF VALVES ALONG THE PIPELINE?

A. Section 195.260 requires valves be placed at the following:

(a) On the suction end and the discharge end of a pump station in a manner that permits isolation of the pump station equipment in the event of an emergency.

(b) On each line entering or leaving a breakout storage tank area in a manner that permits isolation of the tank area from other facilities.

(c) On each mainline at locations along the pipeline system that will minimize damage or pollution from accidental hazardous liquid discharge, as appropriate for the terrain in open country, for offshore areas, or for populated areas.

(d) On each lateral takeoff from a trunk line in a manner that permits shutting off the lateral without interrupting the flow in the trunk line.

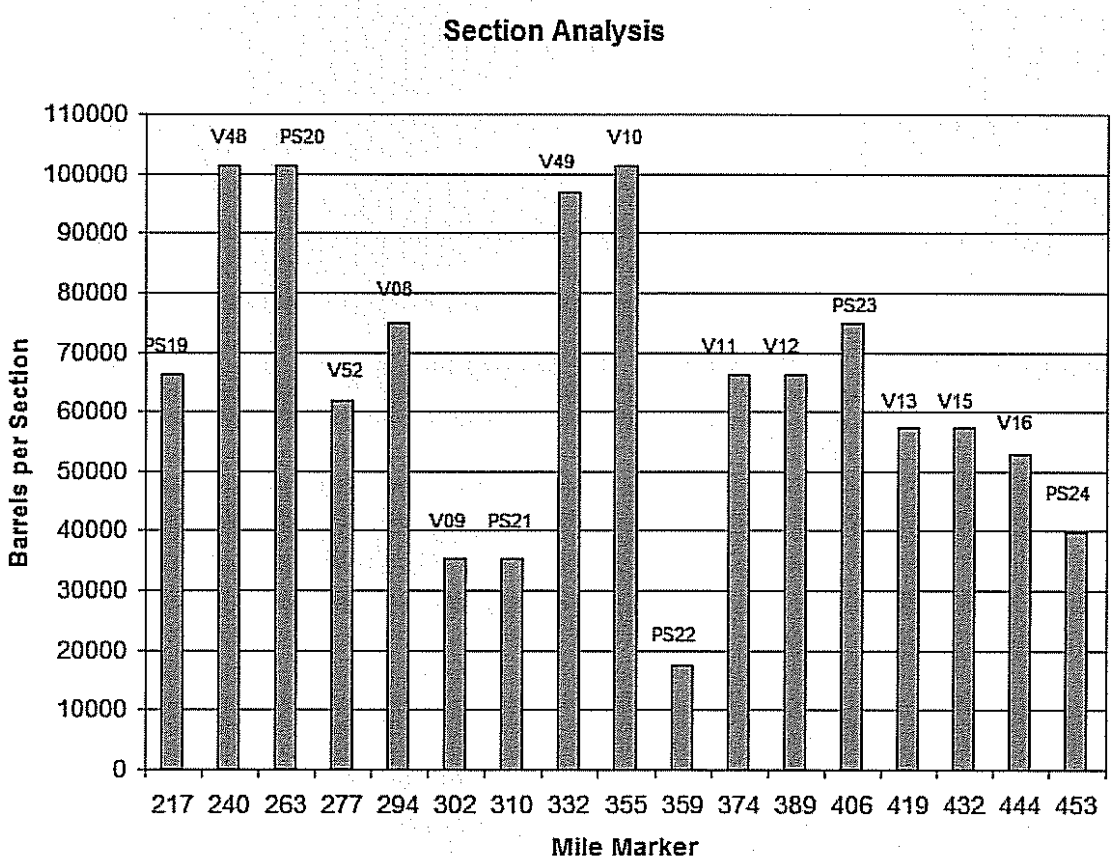
(e) On each side of a water crossing that is more than 100 feet (30 meters) wide from high-water mark to high-water mark unless the Administrator finds in a particular case that valves are not justified.

(f) On each side of a reservoir holding water for human consumption.

Sub sections (b), (d), and (f) are not applicable to the Keystone pipeline. The Keystone pipeline system has 14 valves planned within the state of South Dakota. From Data Response 6-33, Keystone complies with valve placement requirements at all pumping stations, sub section (a). Valves V13 and V15 are in compliance with sub section (e) pertaining to the James River for both V13 and V15, and the Missouri River for V 15. All other valves are listed as sub section (c), minimizing damage and pollution.

The placement of valves along the Keystone pipeline is discussed in the Pipeline Risk Assessment and Environmental Consequence Analysis which was filed with the Keystone Site Application as Exhibit C. The document and its appendices, A – Frequency-Volume Study of Keystone Pipeline, and B – Preliminary Evaluation of Risk to High Consequence Areas, discuss the rationale for the placement of valves along the pipeline route.

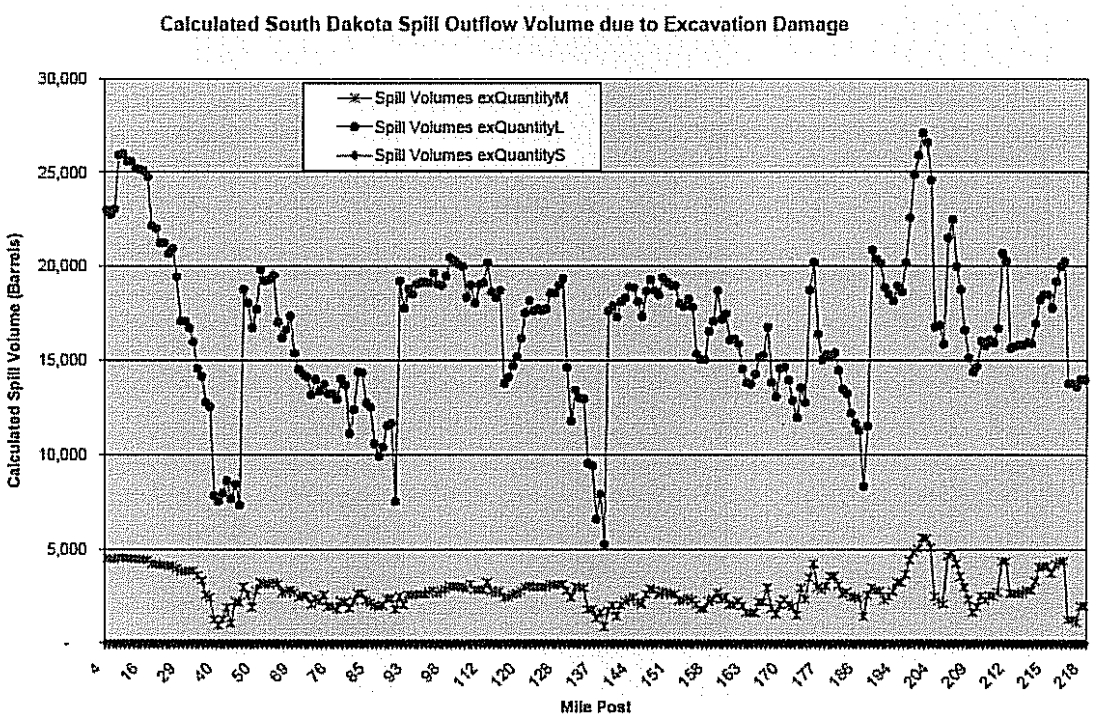
The plot below shows the pipeline segments between valves and their volume capacity in barrels of oil. The Barrels per Section is the volume the segment can hold upstream of the valve. For example, if all the valves on the system were closed, the pipeline segment between valves V52 and V08 would hold about 75,000 barrels. The graph could also be plotted as miles instead of barrels (17 miles for the example segment), but the volume of oil emphasizes the risk of a spill.



Assessing the valve placement with the aid of the elevation profile of the pipeline helps to reveal some patterns for managing risk. The primary pattern is that segments with less than 60,000 barrel capacity are typically protecting HCAs against large volumes of oil in the event of a release. Those segments with capacities above 60,000 barrels tend to have very uniform elevation profiles, typically less than a 100 feet difference between any two points along the line. Those longer segments were chosen with small drain down volumes, most having very localized, if any, low elevation regions.

The exceptions are the two large capacity segments in the north, V48 and PS 20. Both segments have long (6 and 10 mile respectively), continuous elevation differences of 100 feet with large drain down volumes. The segments could result in spill volumes of over 40,000 barrels in the unlikely event of a large hole (10" diameter from the Frequency – Volume Study of Keystone Pipeline) resulting in a release near the bottom of the slope.

Data Response 2-14 presents a plot (Figure 2, shown below) of calculated spill volumes along the pipeline route in South Dakota. The large volume (over 25,000 barrels) on the north portion corresponds to these valve segments. Using the equations for the flow rates from the Frequency – Volume Study of Keystone Pipeline, the large diameter hole (10") releases approximately 19,500 barrels before detection and isolation (11.5 minutes). After isolation, the balance of the 25,000 would take approximately 45 minutes to drain down from a 100 foot elevation difference. The emergency response team would have to have the leak excavated and clamped within 45 minutes to keep the spill at 25,000 barrels. From the drain down calculation, a 2 hour response time to clamp the leak would result in a total spill volume of 37,000 barrels, 3 hours – 46,000 barrels.



The response time that Keystone indicates for the high volume area with tier 1 resources is 6 hours (Data Response 2-12). It seems unlikely that the calculated spill volume could

be contained to just over 25,000 barrels based on this response time. For completeness of available information regarding the risks for this project, we request that Keystone present the assumptions and justifications for the calculated spill volumes.

With the above considerations noted, the overall selection of valve placement appears to provide a rational, risk-based approach to protecting populated areas, the environment, and drinking water supplies. As the requirements for HCAs are re-evaluated for the region in the vicinity of the pipeline, the location of valves installed to protect these areas should be continually re-assessed.

Q. 195.262 – WHAT SAFETY AND EMERGENCY POWER SUPPLY CONSIDERATIONS ARE INCLUDED AT PUMPING STATIONS?

A. Data Response 6-34 indicates that Keystone pumping stations will include safety devices that will prevent over-pressure of pumping equipment. Auxiliary power will be provided by an uninterruptible power supply (UPS) system.

Q. WHAT ASPECTS OF PIPELINE SAFETY ARE ADDRESSED IN SUBPART E - PRESSURE TESTING?

A. The Federal Safety Regulations require that the pipeline be pressure tested to 1.25 times the maximum operating pressure (MOP) for a duration of 8 hours. The pressure testing is performed to ensure the integrity of the pipeline design and construction prior to placing the line in operation.

Q. 195.304 – HOW DOES KEYSTONE PLAN TO PRESSURE TEST THE PIPELINE IN ORDER TO SATISFY THE FEDERAL REGULATION?

A. Keystone's initial plan was submitted in Data Response 6-35 as a draft entitled 'KPP-901 Specification for Cleaning, Filling, Hydrostatic Testing, Dewatering and Drying Rev. 0, dated August 13, 2007.' Also included were hydraulic profile sheets of the pipeline with proposed elevations and test pressures. The final plan is expected to be completed in April, 2008 when all permits have been received.

The plan includes using 9 test segments within South Dakota. Each segment will have a minimum pressure of 1800 psi (1.25 times the 1440 psi MOP). Sections at lower elevations will be tested at higher pressure. The highest pressure in the proposed plan is 1981 psi in the directional drill section of the Missouri River crossing. The wall thickness of the pipe in river crossings is 0.611 inches so the stress in the pipe wall resulting from the 1981 psi pressure from the test is only 60% of SMYS.

Execution of the submitted hydrostatic test plan will be in compliance with the Federal Safety Regulations.

Q. WHAT ASPECTS OF PIPELINE SAFETY ARE ADDRESSED IN SUBPART F - OPERATIONS AND MAINTAINENCE?

A. Subpart F provides the minimum requirements for performing operation and maintenance on hazardous liquid pipelines. Addressed in this subpart are procedural manuals, emergency response training, maximum operating pressure, communications, line markers, security of facilities, public awareness, and damage prevention programs.

Q. 195.402 – HAS KEYSTONE DEVELOPED A PROCEDURAL MANUAL FOR OPERATIONS, MAINTENANCE, AND EMERGENCIES?

A. The manuals will be developed in 2008 and completed prior to commencing operations in 2009 as stated in Data Response 3-36. The Emergency Response Plan presented in the Siting Application Exhibit C is reviewed in other testimony prepared by Staff.

Q. 195.406 – WHAT PROVISIONS ARE PLANNED TO MAINTAIN LINE PRESSURE FROM EXCEEDING 110% OF MOP DURING SURGES?

A. Keystone has performed a preliminary surge analysis using a transient hydraulic pipeline model as stated in Data Response 6-38. Safety devices at the station to prevent the pipeline from over-pressuring include safety relief systems, pump station discharge pressure control valve or pump speed control, automated flow rate or suction pressure control set points, and automatic pump station shut down if pressure exceeds a preset limit.

The importance of minimizing pressure surges is increased with the granting of the 80% SMYS special permit. The decrease in wall thickness results in higher hoop stress and a higher percentage of SMYS being utilized during a pressure surge.

We would request that Keystone include the effects of unexpected, instantaneous loss of pumping equipment in the surge analysis to ensure that the pipe stress remain with the acceptable limit.

Q. 195.430 – WHAT FIREFIGHTING EQUIPMENT WILL BE AVAIALBLE AT PUMPING STATIONS?

A. Fire and lower explosive level (LEL) gas detectors will be installed in electrical buildings at each pump station as indicated in Data Response 6-41. Electrical buildings will be equipped with high and low temperature alarms and intrusion switches. Fire extinguishers will be installed inside buildings near the entrance. These fire safety measures should provide adequate protection for the pumping stations.

Q. 195.436 – WHAT PROVISIONS ARE PLANNED FOR SECURITY OF FACILITIES FROM UNAUTHORIZED ENTRY AND VANDALISM?

A. Pump stations will be enclosed by a security fence and gates will be kept locked as stated in Data Response 6-42. The pump stations will also be remotely monitored 24

hours a day from the operations control center. Other above ground facilities, such as valve sites, will be fenced.

These security measures are adequate for protecting the pipeline facilities from unauthorized entry.

Q. TO THE EXTENT THAT DATA IS AVAILABLE, DOES IT APPEAR THAT TRANSCANADA KEYSTONE PIPELINE, LP IS IN COMPLIANCE WITH PART 195 AND THE SPECIAL PERMIT CONDITIONS?

A. The data that has been presented through the siting application, the granting of the special permit, testimony from Keystone, and responses to data requests provide sufficient information to conclude that Keystone is in compliance with Part 195, Subparts C, D, and F as presented in this testimony. The Integrity Management Plan of Subpart F and Subpart H, Corrosion Control, are examined in other testimony.

Q. ARE THERE ANY OTHER RECOMMENDATIONS THAT YOU HAVE REGARDING THIS PROJECT?

A. I recommend clarification on two points:

1. As discussed in the section regarding Valve Location (195.260), I recommend that Keystone should provide justification and assumptions for limiting the maximum spill volumes to 25,000 barrels from a 10 inch diameter hole. Isolation times and field response times suggest that the volumes could exceed 40,000 barrels.

2. I recommend that Keystone present the final surge mitigation design including surge analysis and validation results for review. The granting of the 80% SMYS special permit removes some of the safety factor in line pipe that the current CFR 49 195 requirement of 72% SMYS affords.

EN Engineering

William J. Walsh, Ph.D., PE
Senior Project Manager

Education

Ph.D. Theoretical and Applied Mechanics, Northwestern University, 2004
M.S. Metallurgical Engineering, Univ. of Illinois at Urbana-Champaign, 1986
B.S. Engineering Mechanics, Univ. of Illinois at Urbana-Champaign, 1984

Professional Registrations

Registered Professional Engineer – Illinois

Affiliations

American Society of Mechanical Engineers (ASME)

Summary of Experience

Engineering Project Manager skilled in applying principles of mechanics and material science to the solution of industrial problems in pipeline, manufacturing and research environments. Certified Six-Sigma Black Belt. Proficient in the use of ABAQUS™ and other finite element codes.

Project Experience

EN Engineering, Woodridge, Illinois

Fracture Control Plan Development – 80% SMYS Special Permits – Perform engineering assessment of fracture initiation and ductile fracture propagation properties in support of clients permit requests from PHMSA.

Pipe Buckling Failure Analysis of HDD Installation – Root cause determination of pipe failure resulting from severe overstress by contractor. Mechanics analysis and metallography were critical aspects of determining sequence of loading and ultimate cause.

Girth Weld Crack Analysis – Verification of rail crossing case design for a girth weld crack immediately outside of casing pipe. Crack initiation and growth determined to be unrelated to rail traffic loads.

Microbiologically Influenced Corrosion (MIC) Leak in Pipeline Drip – High strength fitting leak determined to be caused by MIC through liquids analysis and metallographic corrosion pattern identification.

Rexam Beverage Can North America, Elk Grove Village, Illinois

Aluminum Bottle Development and Commercialization – Coordinate technical activities between team members at Rexam and outside vendors to bring drawn-and-ironed aluminum bottles to the North American market by 2Q07. Responsibilities include solid modeling of potential bottle shapes for marketing and engineering evaluation, establishing metalworking parameters for bottle performs, coordinating commercial manufacturing facility development, budgeting and scheduling project activities.

24 oz. Down Gauging / Light Weighting – Implemented program in 3 can plants by installing new cupping press die sets and bottom dome profile tooling. Worked with plant personnel bring plant to full production with minimal downtime. Metal savings resulted in $3,000,000 annually.

Engineering Database Implementation (SAP) – Coordinated the conversion of 3 separate engineering group's drawing databases into a centralized database system. Responsible for guiding consultant activities, developing training materials, and instructing database users on procedures for new system.

ENGineering

William J. Walsh, Ph.D., PE
Senior Project Manager

Project Experience (cont'd)

Standardize Finite Element Process for Designing Can Bottom Dome Profile – Implemented web based system for performing routine finite element runs for bottom dome designs. Prepared ABAQUS™ script in Python programming language to automate material selection, boundary condition application, and pressure loading. Analysis time reduced from 1 hour to 8 minutes.

12 oz Light Weighting – Assisted with program to reduce metal volume in can wall. This six-sigma black belt program resulted in annual savings of $7,000,000.

Snap-on Tools, Bensenville, Illinois
Room Temperature Forming Process Development – Snap Ring Pliers – Lead engineer on project to develop novel room temperature forming process for snap ring pliers. Designed progressive die sequence for Grabner ten station press utilizing properties of low temperature flow stresses. Finite element analyses performed to eliminate die fracture using DEFORM™ and ANSYS™ software.

Powder Metal Forging Program – Responsible for design of press-fit tooling for hot impact powder forging resulting in increased die life under large forging stresses. Die stresses verified with strain gages and accelerometers using LabView™ data acquisition software

Natural Gas Pipeline Company of America, Lombard, Illinois
Press-fit Flywheel Design – Discovered cracking in crankshaft of natural gas compression using NDE techniques. Designed press-fit flywheel hub repair for the shaft, extending flywheel life for more than 10 years.

Strain Gauges for Service Critical Piping – Directed the strain gauge placement and data acquisition monitoring of stresses for critical gas storage piping subjected to excessive bending during service.

Pipeline Integrity Assessment – Development of integrity management procedures, integrity management database and risk based threat assessment algorithm PIMAR

Station Piping Design – Lead on design of header piping for compressor station cooling unit to achieve increased horsepower capacity.

Failure Analysis Investigations – Responsible for investigating pipeline and component failures including:

- corrosion leak failures in underground storage main gathering laterals and wellhead leads
- weld cracking on compressor station heat exchanger unit

Material and Welding Specifications – Developed company pipe material and welding procedure specifications. Represented company at pipe mill pre-production meetings for new pipeline construction.

ENEngineering

William J. Walsh, Ph.D., PE
Senior Project Manager

Project Experience (cont'd)

Battelle Columbus Laboratories, Columbus, Ohio
Metals and Ceramics Group
Tungsten Extrusion – Developed thermo-mechanical processing methods resulting in 5% performance increase for anti-tank kinetic energy penetrators.

Beryllium Technology – Prepared summary paper on beryllium alloy processing and properties for Metals and Ceramic Information Center.

Mechanics Group
Gas Industry Projects – Contributed to the development of mechanics based model for predicting stress corrosion cracking in steel pipelines. Developed ANSYS™ analyses procedures for estimating corrosion allowance for operation of pressurized line pipe.

Fatigue of Weldments – Developed prediction schemes for fatigue of weldments containing porosity for use in Coast Guard design criteria.